At Long Last, the Long IMERG Record [Selected Early Results]

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QUALITY INDEX – REVISED IN V06

Half-hourly QI (revised)

- approx. Kalman Filter correlation
  - based on
    - times to 2 nearest PMWs (only 1 for Early) for morphed data
    - IR at/near time (when used)

$$QI_b = tanh\left(\sqrt{\sum arctanh^2(r_i)}\right)$$

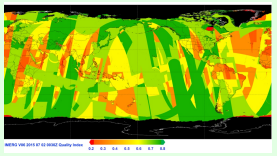
- where r is correlation, and the r's are for forward propagation, backward propagation, and IR
- or, an approximate correlation when a PMW is used for that half hour

- revised to 0.1° grid (0.25° in V05)
- thin strips due to inter-swath gaps
- blocks due to regional variations
- snow/ice masking will drop out microwave values

The goal is a simple "stoplight" index

- ranges of QI will be assigned
  - good 0.6-1
  - use with caution 0.4-0.6
  - questionable 0-0.4
- is this a useful parameter?

IMERG-Final QI 02 July 2015, 0030 UTC



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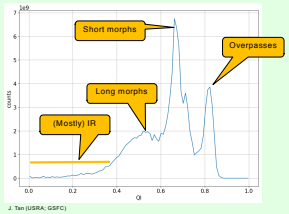
IMERG-Final QI Histogram 15 March 2019



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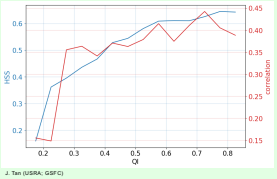
IMERG-Final Heidke Score and Correlation as a Function of QI 15 March 2019



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Ocean (50°N-S) Precip Time Series

V06 Final Run starts June 2000

V06 is higher than 3B43 (TMPA) and GPCP over ocean

TRMM-era IMERG has a strong semi-annual signal

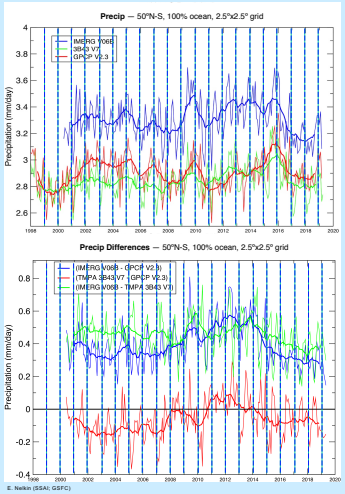
- GPCP, IMERG and 3B43 dominated by the annual cycle

Interannual variation

- has similar peaks/troughs for all datasets
- GPCP (passive microwave calibration) has a phase of 3B43 (through 2013), IMERG (both PMW/radar calibration)
- after September 2014, 3B43 (PMW calibration) matches GPCP phase

Additional multi-year variations

- IMERG and 3B43 are High Resolution Precipitation Products, not CDRs
- difference plots tend to emphasize these multi-year variations
- the interannual variations tend to be similar
- phasing differences and differences in amplitude of interannual variation have similar magnitudes

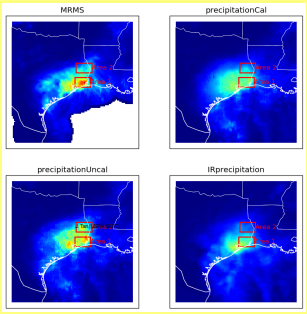


E. Nelkin (SSAI; GSFC)

HURRICANE Harvey, 25-31 August 2017

Harvey loitered over southeast Texas for a week

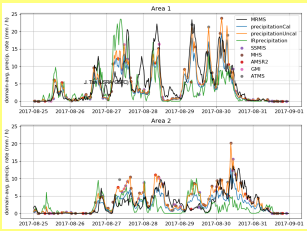
- MRMS considered the best estimate
  - some questions about the details of the gauge calibration of the radar estimate
  - over land
- Uncal (just the intercalibrated satellite estimates) under(over)-estimated in Area 1(2)
  - should be similar to Late Run
- Cal (with gauge adjustment) pulls both areas down
- microwave-adjusted PERSIANN-CCS IR has the focus too far southwest



J. Tan (USRA; GSFC)

IMERG largely driven by microwave overpasses (dots)

- except duplicate times
- not just time interpolation
  - systems move into / out of the box between overpasses
- satellites show coherent differences from MRMS
  - microwave only "sees" the solid hydrometeors (scattering channels), since over land
  - IR looks at Tb within "clustered" data
  - both are calibrated to statistics of time/space cubes of data
    - Cal is basically (*Uncal x factor*)
- short-interval differences show some cancellation over the whole event
  - but several-hour differences can be dramatic



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Tropical Ocean (50°N-S) Monthly Precip Histogram Time Series

Histogram of Final Run monthly tropical oceanic precip on 0.1° grid, 20° N-S (top)

- log(counts) to help draw out small values

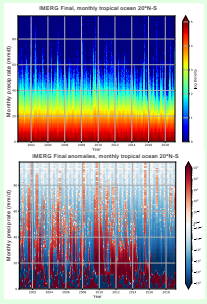
Anomaly helps guide interpretation (bottom)

- log scale in both directions from zero
- filtered in time to emphasize main features

Initial impressions

- mid-to-high rates sometimes (2009-10) vary together, but not always (2006-07)
- lower rates tend to vary in the opposite direction
- start of GPM calibration (June 2014) seems to shift the PDF to lower rates
- persistent mid-range positive anomalies in 2009-14 remain to be explained

This discussion will help determine reliability for trend analysis



G. Potter (USRA; GSFC)

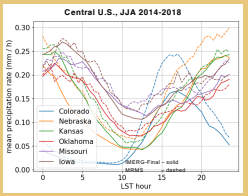
Diurnal Cycle

Average June-August for 2014 to 2018 (5 summers) for 6 states, Final Run

Compared to Multi-Radar Multi-Sensor (MRMS; dashed), Final (solid) shows:

- lower averages (despite use of gauge data)
- lower amplitude cycle in Colorado
- higher amplitude cycle in Iowa
- very similar curve shapes, peak times

This version of MRMS only starts in 2014, so an extended comparison requires different data



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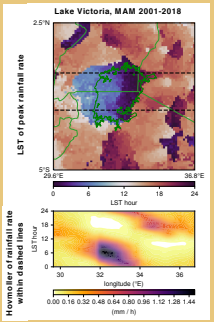
Nocturnal convection across Lake Victoria is intense in the boreal spring, and kills up to 5,000 fishermen per year.

There is a strong asymmetry between the eastern and western shores

- mean easterly flow
  - opposes lake breeze to the east
  - reinforces lake breeze to the west
- western shore appears to show nocturnal lake convention drifting well inland
- these patterns are reminiscent of upwind/downwind coasts in Florida

The average rain rates

- drop dramatically at the western shore
- show a decreasing tail from the lake convection and a growing maximum later in the day



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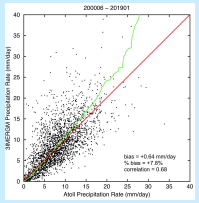
Monthly IMERG-Final vs. Pacific Atolls

Monthly accumulations for tropical Pacific atolls

- Pacific Rainfall Database (PACRAIN)
- match of gauge to encompassing 0.1° grid box
- all useful months
  - stations have various periods of record (potentially changing the regions sampled)
  - 53 "good" atolls, averaging ~11/month
- bias varies with precip rate
  - IMERG under-(over-)estimates at low(high) rates
  - atoll gauges lack undercatch correction
    - likely ~5-10%, so overall IMERG bias is (amazingly) good, but rate biases remain



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FINAL REMARKS AND SCHEDULE

IMERG is now V06B

- the product structure remains the same
  - Early, Late, Final
  - 0.1°x0.1° half-hourly (and monthly in Final)
- new source for morphing vectors
- higher-latitude coverage
- extension back to 2000 (and eventually 1998)
- improved Quality Index

TMPA ending in December

~2 years later: Version 07